

Claims

[c1] What is claimed is:

1. A method for optimizing drilling fluid hydraulics when drilling a well bore, the drilling fluid supplied by a surface pump through a drill string to a drill bit, comprising the step of adjusting the flow rate of a surface pump and a fluid pressure drop across the drill bit while drilling such that the drill bit drilling fluid hydraulics are optimized for a given drilling condition.

[c2] 2. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 1 comprising the further step of controlling the fluid pressure drop and flow rate across at least one additional drilling fluid using device in the drill string intermediate the surface pump and the drill bit.

[c3] 3. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 1 wherein the drill bit comprises a plurality of fluid orifices for discharging the drilling fluid, comprising the further step of controlling the fluid pressure drop across at least one of said orifices.

- [c4] 4. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 3 wherein the pressure drop across the orifice is controlled by changing a cross section area of the orifice.
- [c5] 5. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 1 wherein the drill bit comprises a drilling fluid pressure relief device, the method comprising the further step of controlling the fluid pressure drop across the fluid pressure relief device.
6. A method for optimizing drilling fluid hydraulics when drilling a well bore, the drilling fluid supplied by a surface pump through a drill string to at least one drilling fluid using device in the drill string, comprising the steps of monitoring the pressure of the drilling fluid at the device, adjusting a flow rate of the surface pump, and controlling a drilling fluid pressure drop through the device by selecting from the group consisting of restricting the fluid flow, bypassing the fluid flow and relieving the fluid flow, thereby setting the pressure drop and the fluid flow rate through the device.
- [c6] 7. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 6 wherein the device is selected from the group consisting of drill bits, drilling motors, drilling turbines, rotary directional drilling de-

vices, mud driven electric generators, hole opening devices, measuring while drilling tools, and downhole communication devices.

- [c7] 8. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 7, wherein the device is a Moineau type positive displacement motor, and the method comprises the further step of adjusting the flow rate in response to a downhole temperature adjacent to the motor.
- [c8] 9. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 8, wherein the motor further comprises a rotor sized larger than a stator producing a strong positive interference seal and causing a positive interference fit.
- [c9] 10. The method for optimizing drilling fluid hydraulics when drilling a well bore of claim 9, comprising the further step of adjusting the amount of interference fit between the rotor and the stator by adjusting the pressure drop of the drilling fluid through the motor.
- [c10] 11. A drilling fluid using device for use in a drill string when drilling a well bore comprising a drilling fluid flow restricting device and a drilling fluid flow relief device, wherein in operation the drilling fluid flow restricting de-

vice and the drilling fluid flow relief device are remotely adjusted in operation to achieve optimum drilling fluid hydraulics through the device.

- [c11] 12. The drilling fluid using device of claim 11 wherein the device is selected from the group consisting of drill bits, drilling motors, drilling turbines, rotary directional drilling devices, mud driven electric generators, hole opening devices, measuring while drilling tools, and downhole communication devices.
- [c12] 13. A drill string for drilling a well bore comprising a drill bit, the drill bit comprising a drilling fluid flow restricting device and a drilling fluid flow relief device which are remotely adjusted in operation to achieve optimum drilling fluid hydraulics through the drill bit.
- [c13] 14. The drill string of claim 13 further comprising a drilling fluid using device comprising a drilling fluid flow restricting device and a drilling fluid flow relief device wherein the drilling fluid using device is selected from the group consisting of drilling motors, drilling turbines, rotary directional drilling devices, mud driven electric generators, hole opening devices, measuring while drilling tools, and downhole communication devices.
- [c14] 15. The drill string of claim 14 wherein the drilling fluid

using device is a Moineau type positive displacement motor, and the drilling fluid flow restricting device is adjusted in response to a downhole temperature adjacent to the motor.

[c15] 16. The drill string of claim 14 wherein the drilling fluid using device is a Moineau type positive displacement motor comprising a rotor sized larger than a stator producing a strong positive interference seal and causing a positive interference fit.

[c16] 17. The drill string of claim 16, wherein an amount of interference fit between the rotor and the stator is set by adjusting a pressure drop of the drilling fluid through the motor.